E-SMART: Environmental Sensing for Monitoring and Advising in Real Time

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The James Hutton Institute

The James Hutton Institute

- Leading environmental research institute in Scotland
- Approximately 700 staff at 2 sites (Aberdeen, Dundee)
- Multidisciplinary research
  - Ecosystem services
  - Soils
  - Climate change
  - Land use
  - Crop genetics
  - Etc...

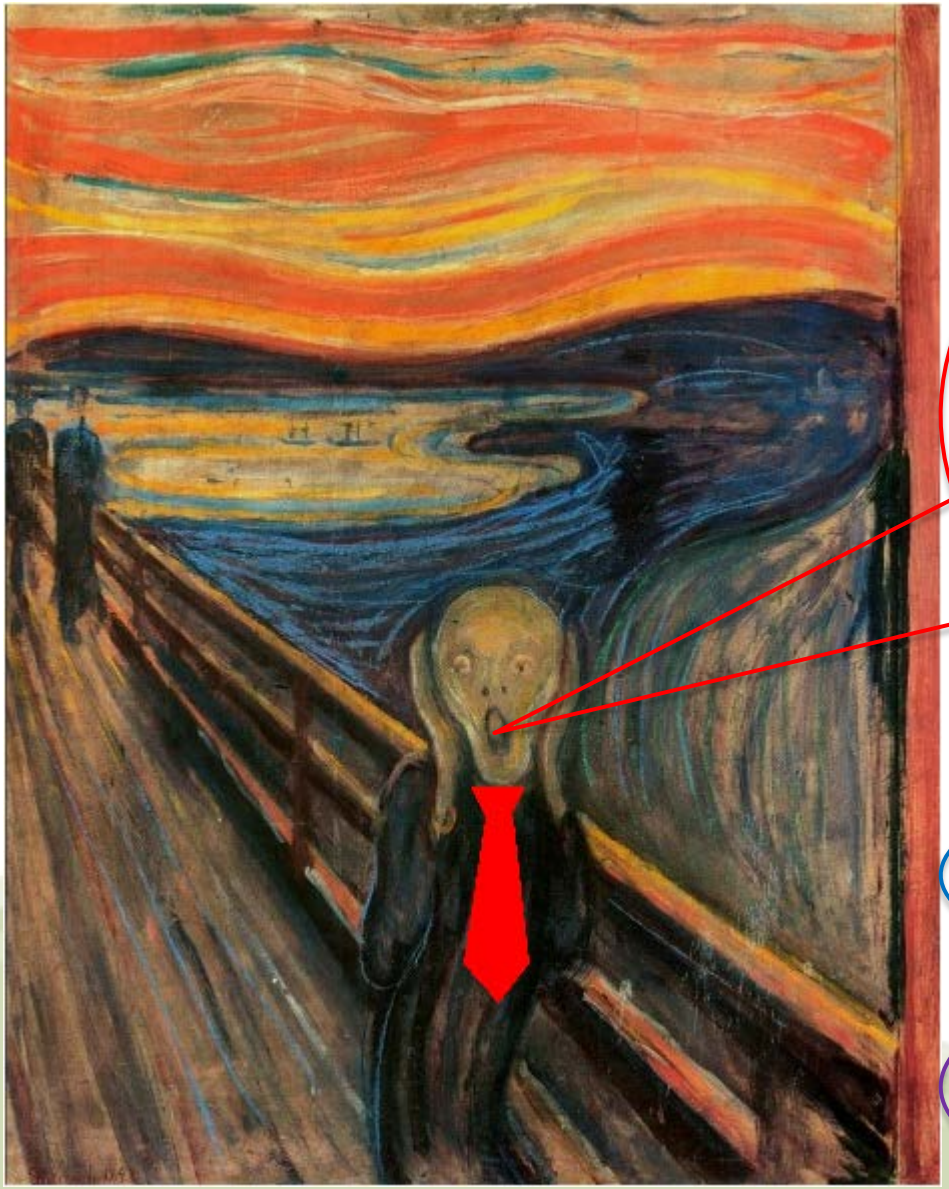
Project outline

- Develop an infrastructure for the development and publishing of mobile phone apps
  - To make better use of the James Hutton Institute's data holdings
  - To compete with other environmental research organisations in the UK
- Demonstrate the infrastructure with one or more apps
  - An app version of an existing soil information website (SIFSS)
  - An app providing an estimate of soil organic matter

Many different points of view

- Senior management
- IT
- Communications
- Contracts
- Graphics
- Soil scientists
- The project team

Senior management



Oh no! Another environmental research organisation in the UK is producing apps! We must jump on the bandwagon!

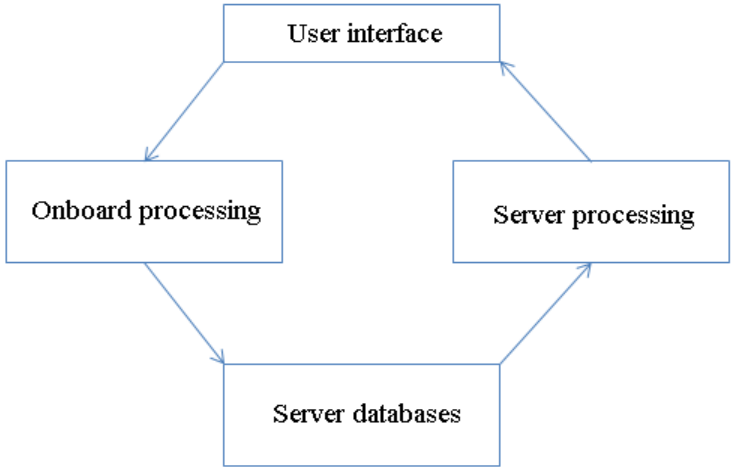
Matt Aitkenhead's got a mobile phone – he must know how to do it!

Good idea!

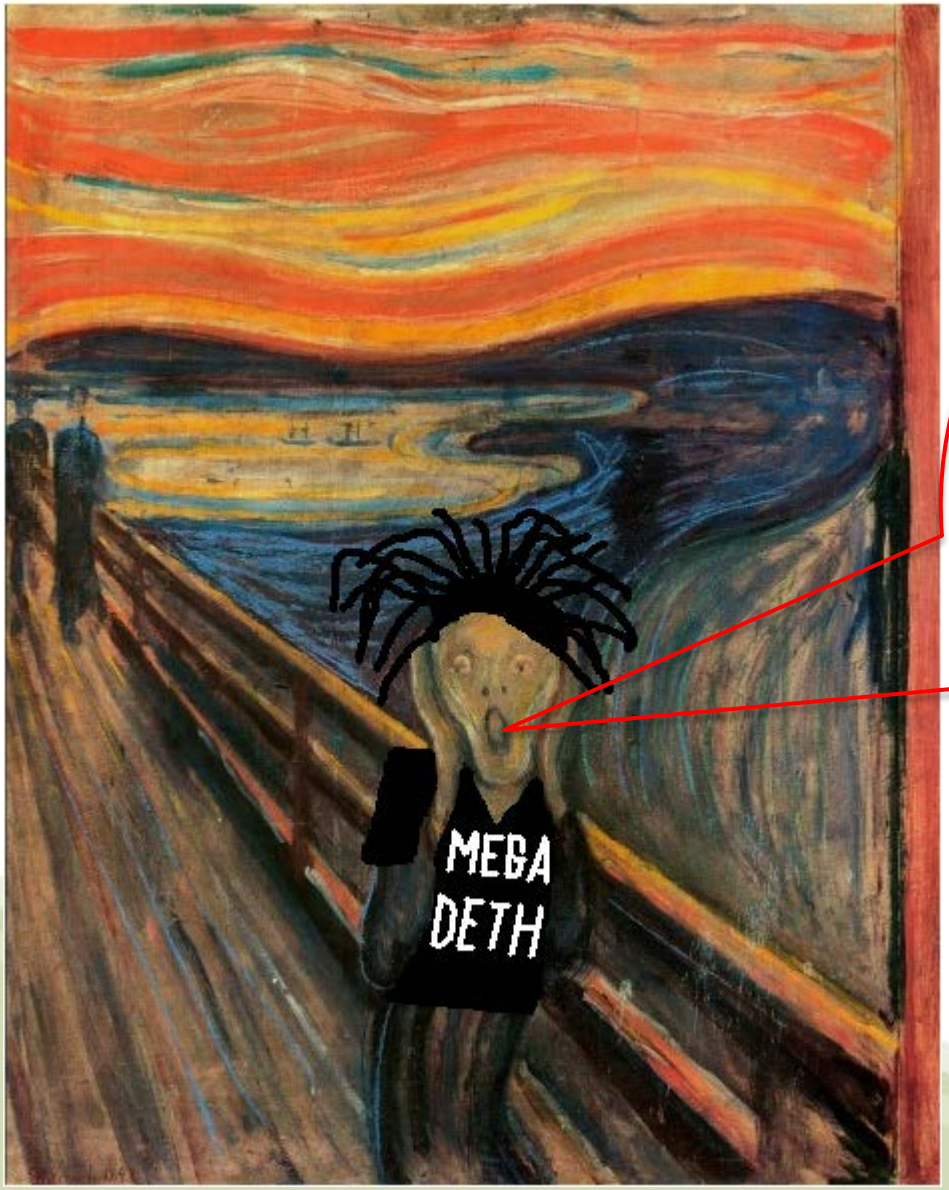
Go get him!

Coming up with a plan

- Several criteria to satisfy:
  - System must use standard mobile phones (no new technology)
  - Must provide useful and relevant information for land managers
  - Make use of existing in-house expertise wherever possible
- Central concept: link models to existing data with apps



IT



You want to do WHAT! The CIA, the Chinese government, Wikileaks, Anonymous – they'll hack the apps, steal our data and crash the system! No way!

A secure and stable system

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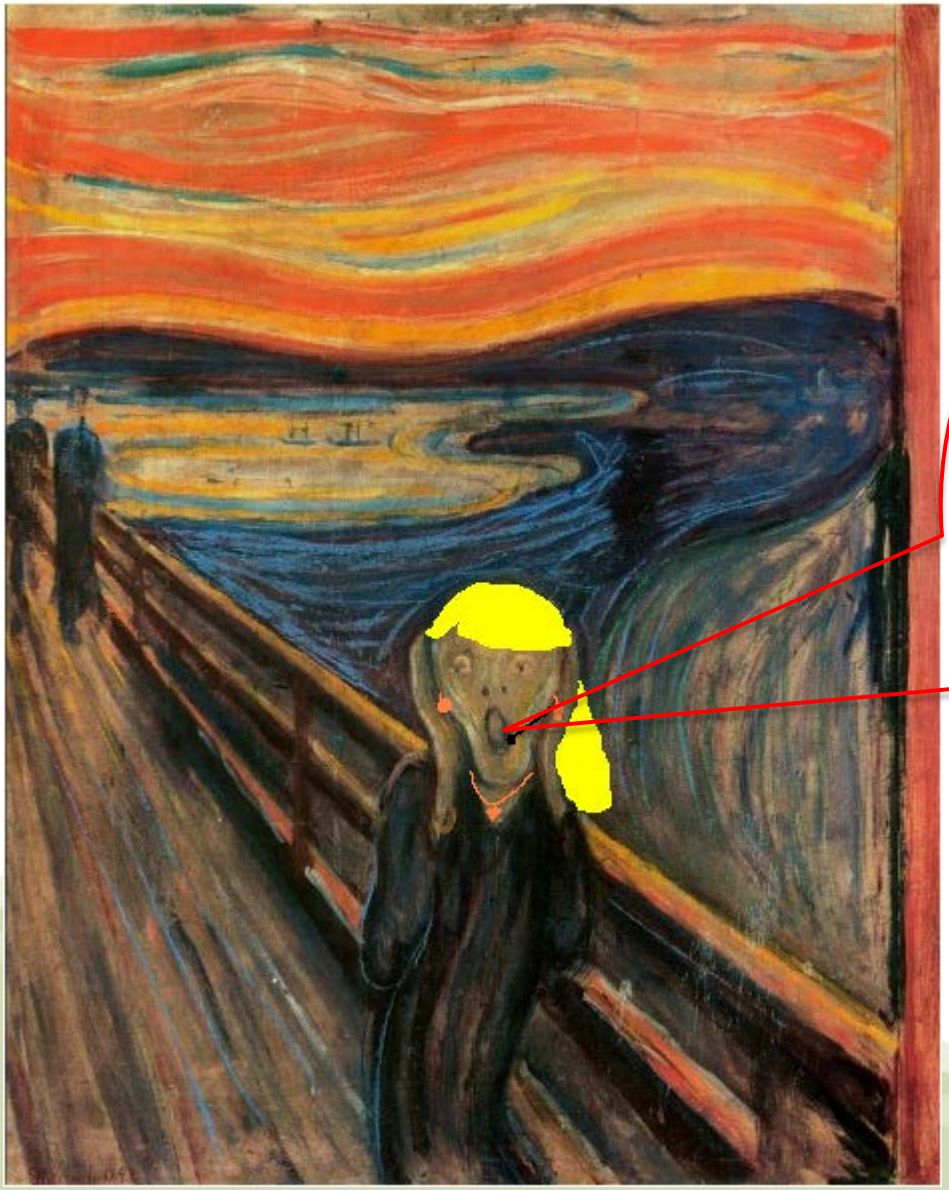
- No large datasets uploaded to apps – use server-side processing
- Spatial datasets and other files kept on a firewalled system
- PHP used to send data to and from mobile phone
  - Cannot send ‘trojan’ queries to hack servers
  - Platform-independent, robust and flexible language
- ‘Paranoid’ I/O system – if it isn’t exactly what was expected, reject the request

Communications

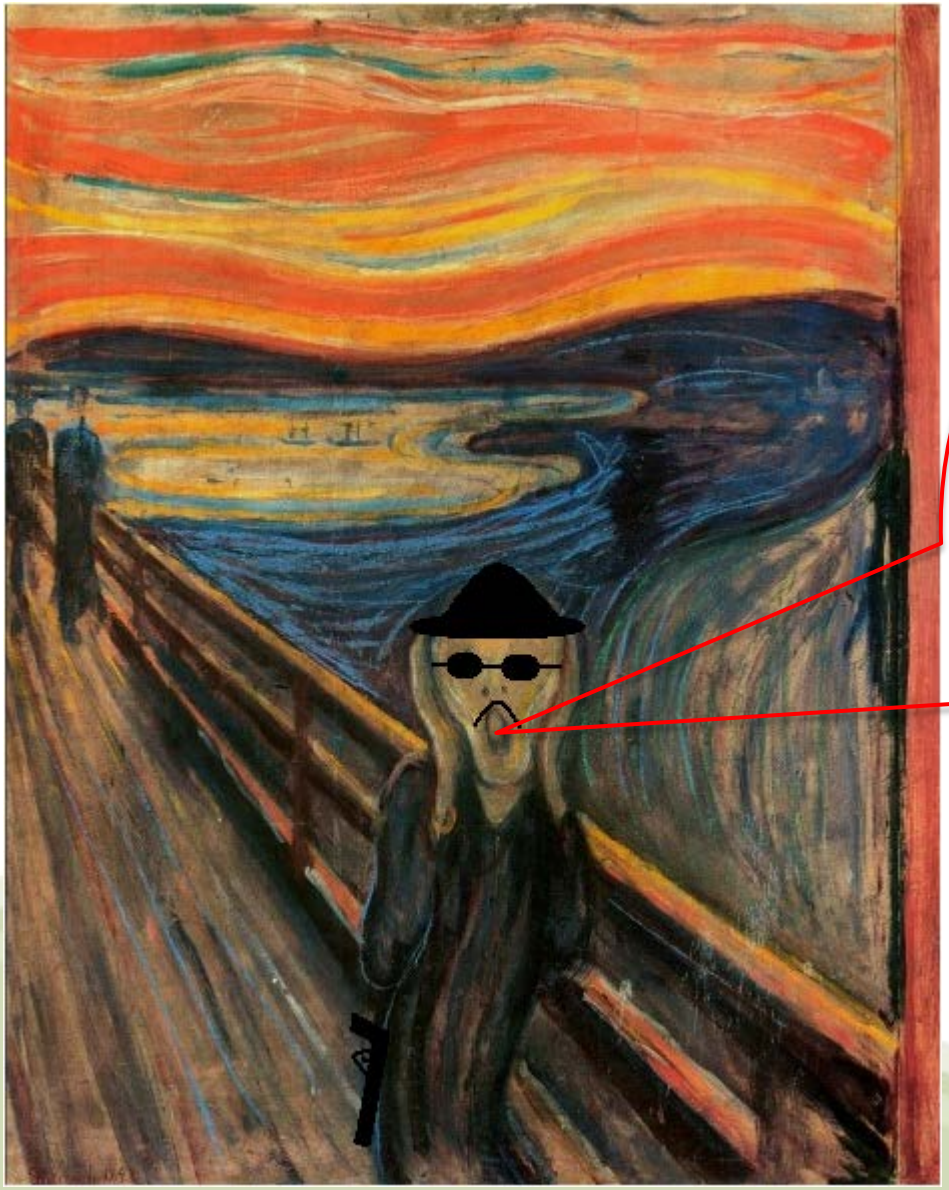


You can't use that font! Or that image! Where's the Institute logo? Who's going to meet with the stakeholders? You?! Nooooo!!! But we need to control what it looks like…

Corporate branding

- A necessary evil?
  - Gets other people to help with the design
  - Produces something that is more polished
  - Raises organisational awareness (a double-edged sword!)
- Important to start thinking about the design/appearance at an early stage
- Balance to be struck between form and function

Contracts & legal

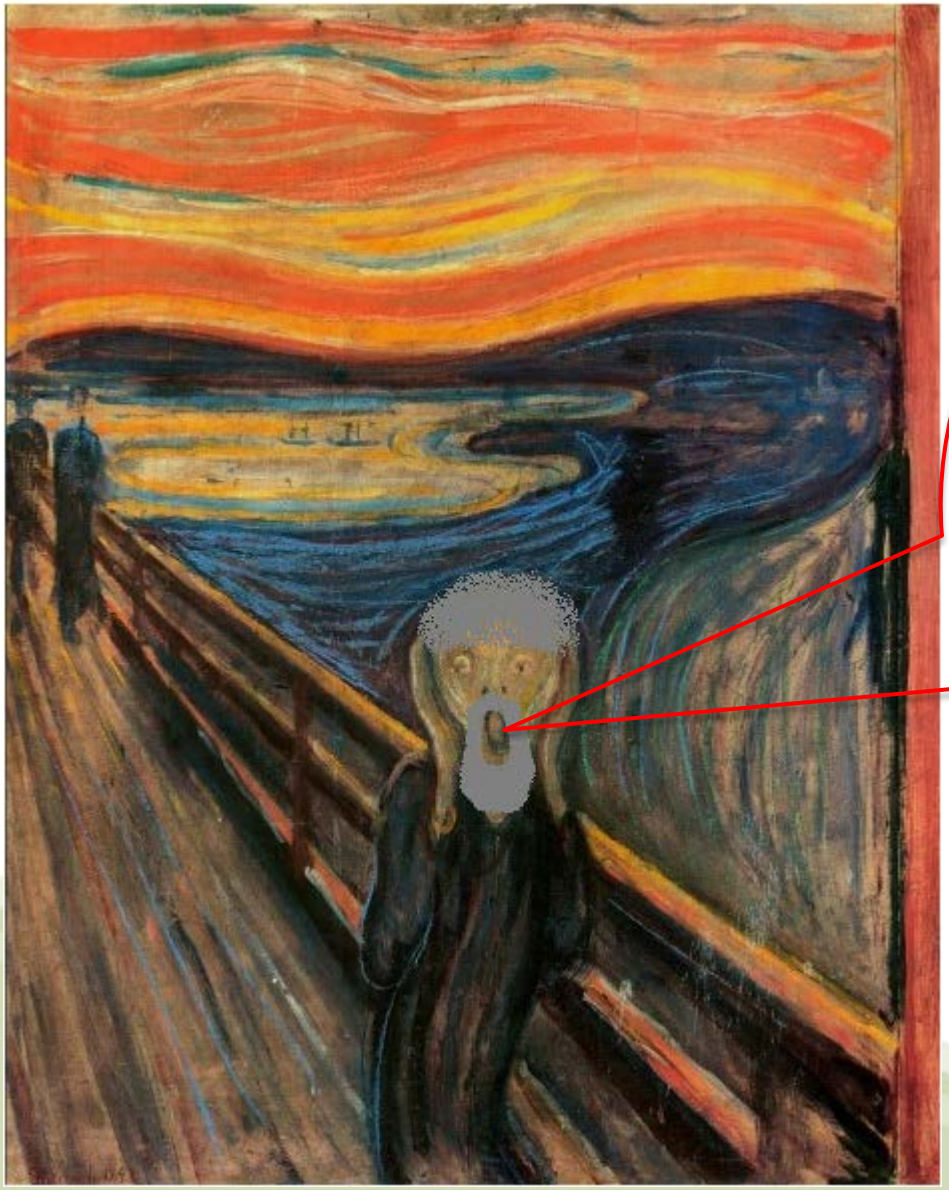


What if someone copies it? Who has the IP? Can we make any money out of it? You want it to be FREE?? What datasets are you using? Are they ours? Don't tell anyone about this!

Legal obligations

- End User License Agreement (EULA)
  - Very important!
  - Get the lawyers involved
  - A lot of licensing information is out there
  - Let the user know what you will do with their data
- IP considerations
  - Models are already in the public domain (scientific research)
  - Funded apps for other organisations – background IP retained, foreground IP shared
  - Stick with datasets that are free for scientific purposes
  - Don’t charge any money – it makes IP issues a lot simpler

Soil scientists

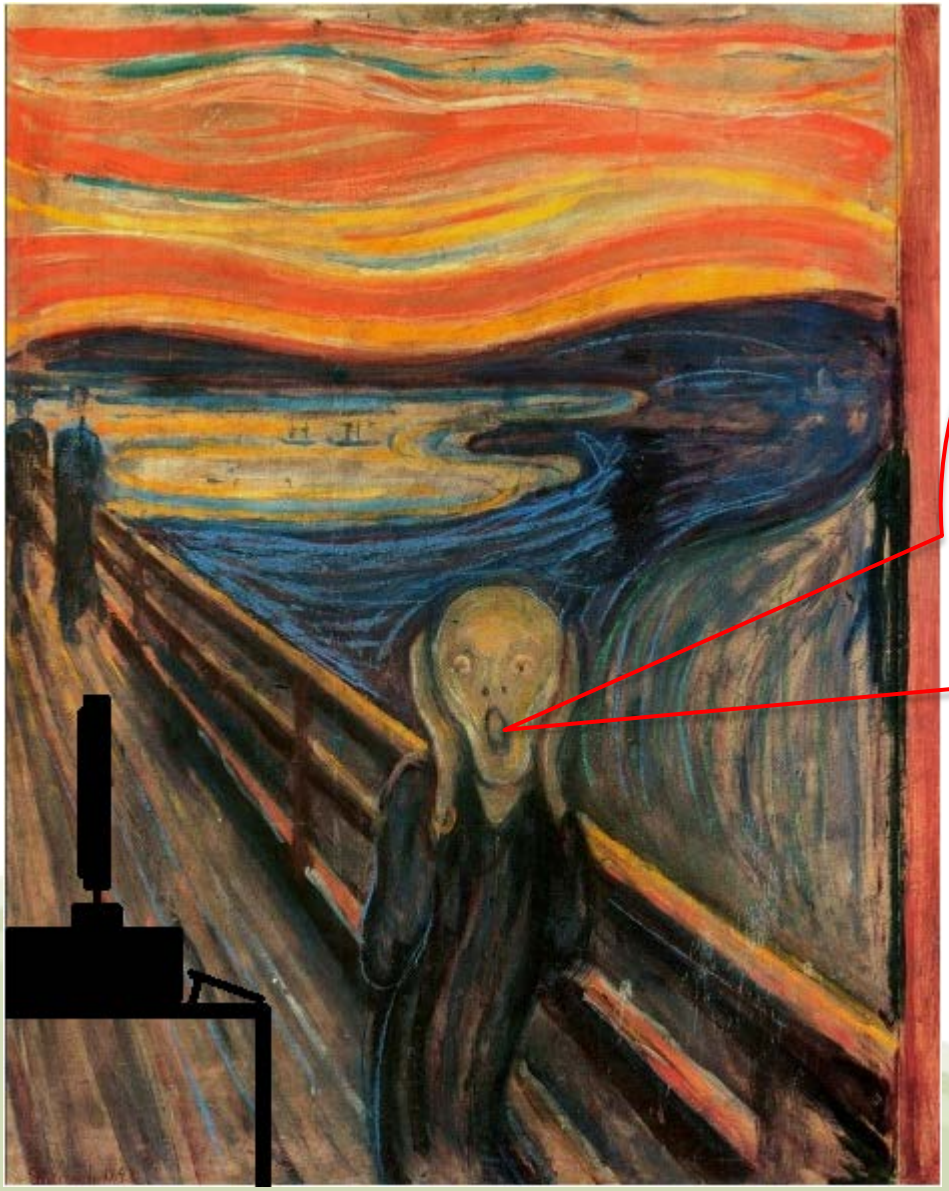


It can't be done! And if it can, you're putting us out of a job! You can't do it!

Getting the science right

- Firstly, there will always be a need for field work
  - No model is 100% accurate
  - Need field data for model development and validation
- Apps should provide useful information to the end-user
  - Consider who the target audience is
  - Keep it simple
- Consult with the field scientists
  - They will tell you if the result makes sense
  - They will be able to advise on information presentation

The project team



You want four people to develop and test an entire mobile phone app infrastructure from scratch in one year, with only 50k?

Achieving the objectives

- Tightly focussed group
  - Developer, data manager, modeller, project leader
- Multiple stages of development
  - Server infrastructure development
  - Dataset preparation
  - App interface
  - Model development
  - Linking algorithms
  - Licensing/IP documentation and user instructions
- Better as a small, directed project or a workpackage within a larger project
- Stick with what you know (and data that is available)

Datasets used

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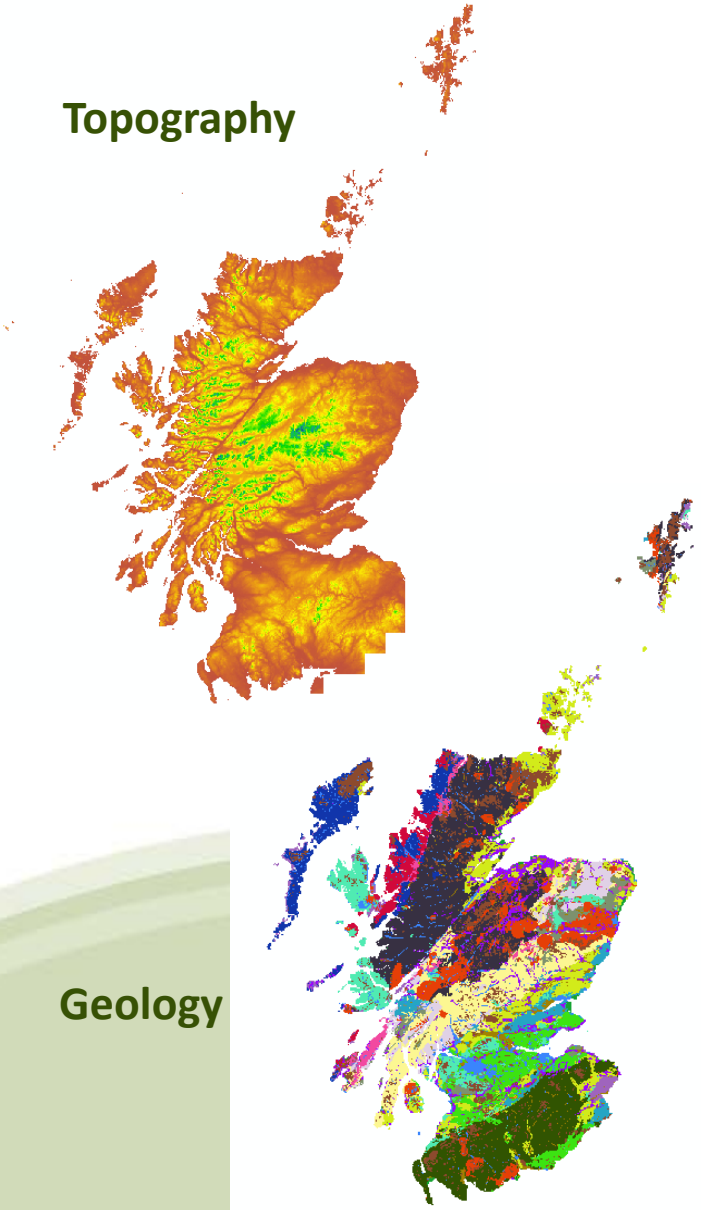
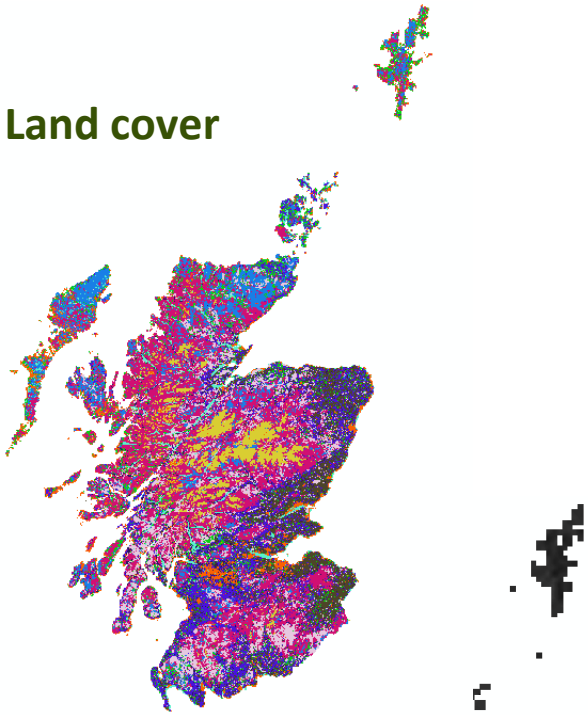
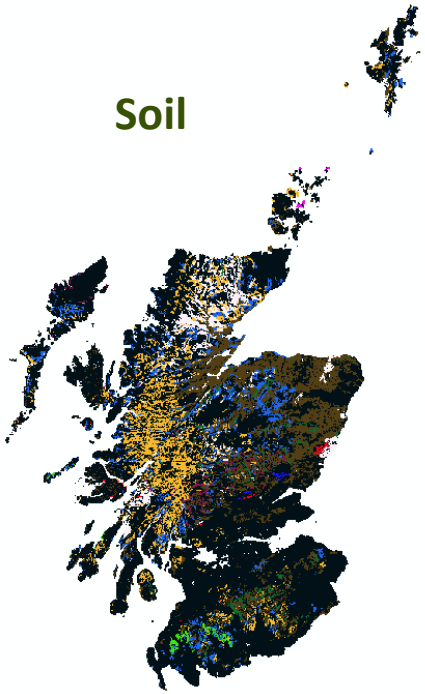
Topography



Land cover



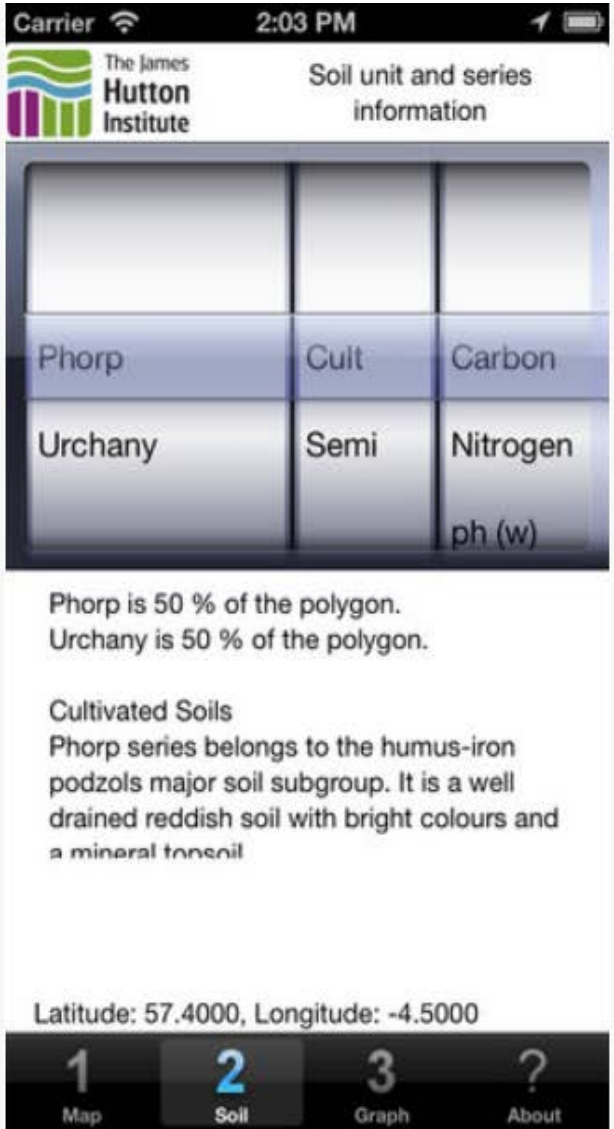
Soil

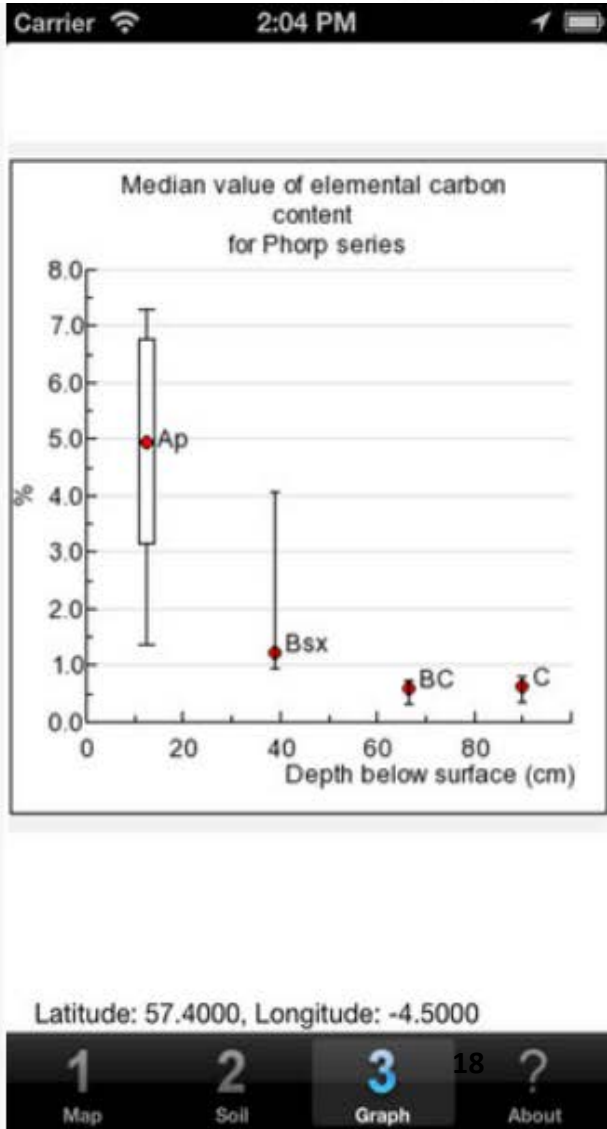


Geology

Climate

The outputs - SIFSS





The outputs - iDee

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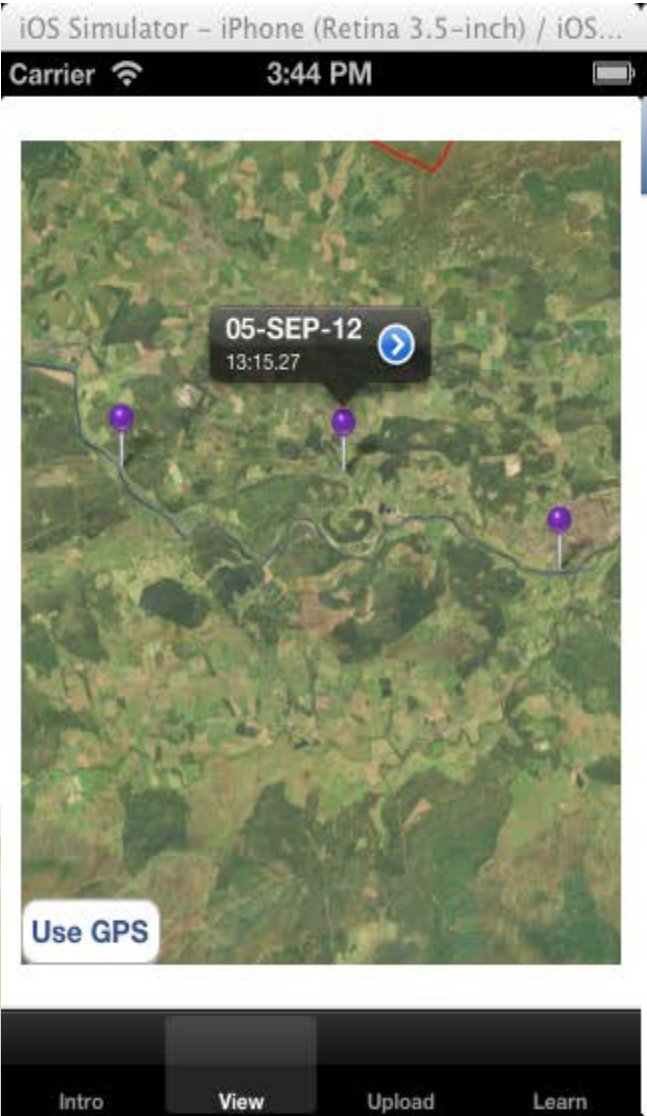

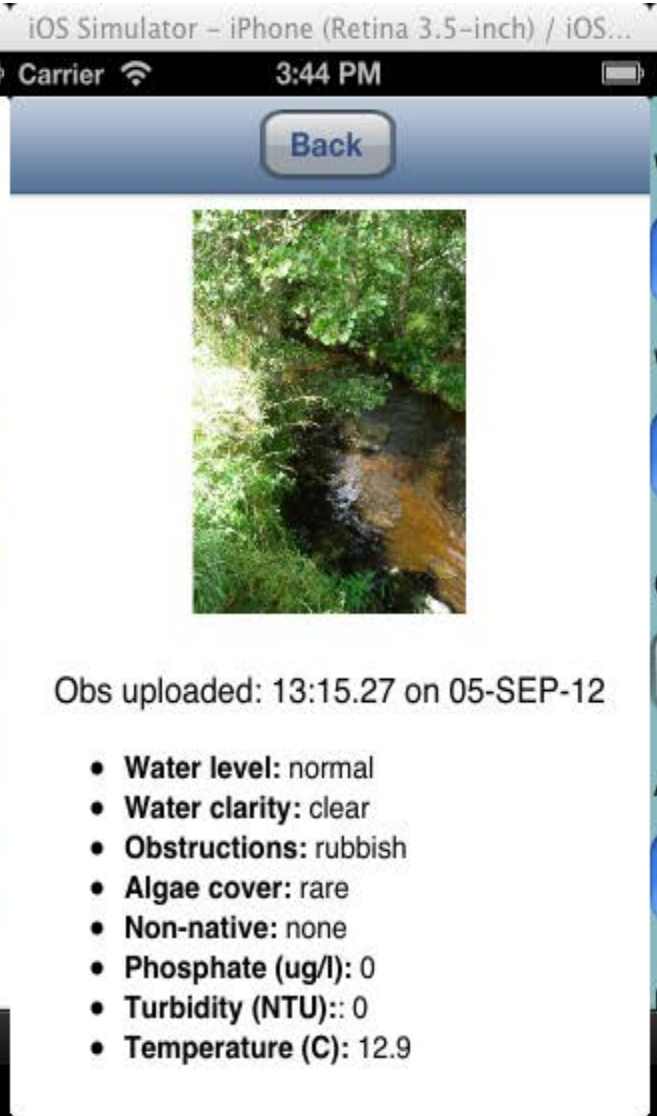

The outputs - SOCiT

Questions?

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